

15601
Soil
1467.6 grams

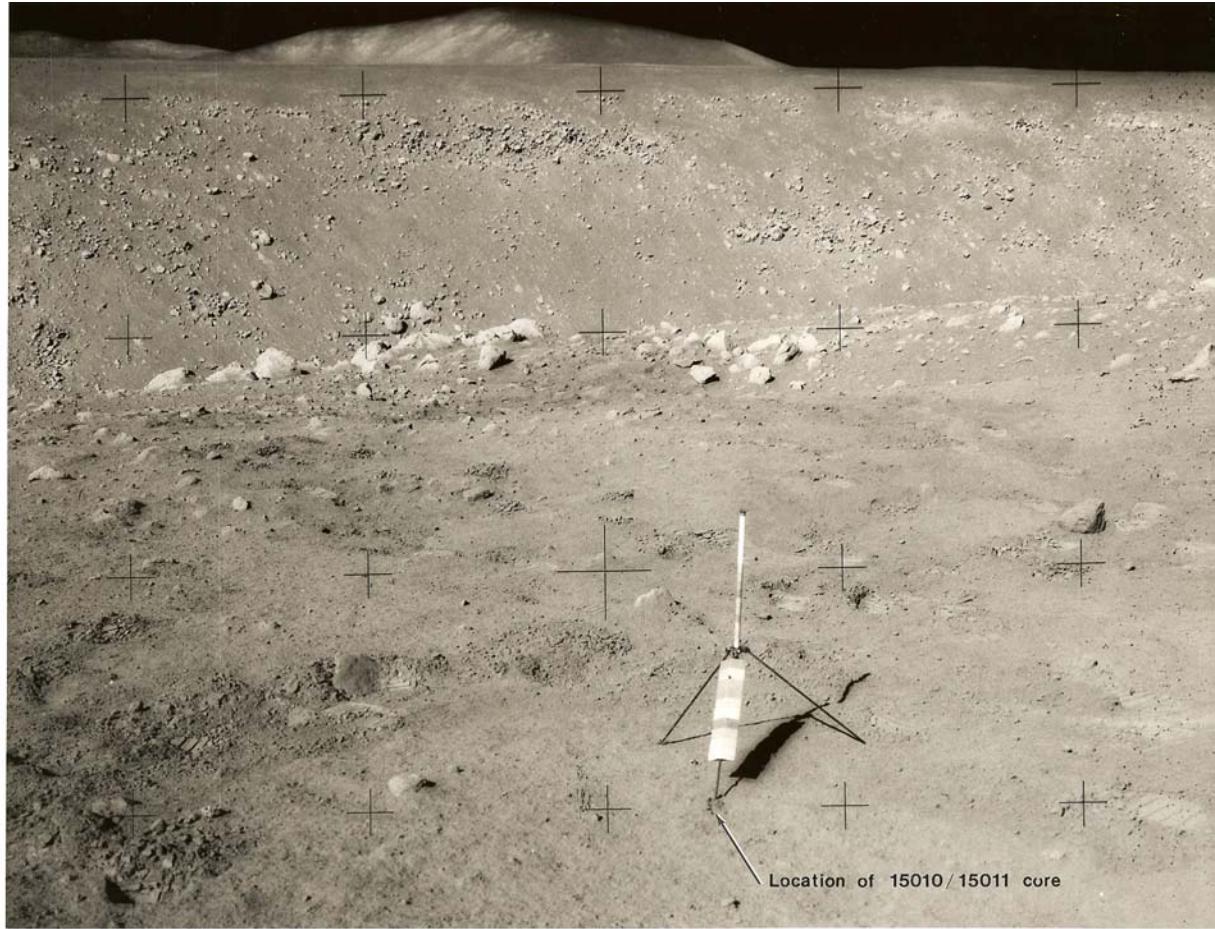


Figure 1: Telescopic photo of station 9a, on edge of Hadley Rille, looking across the Rille. The soil and rake samples were taken just to the left, about 20 meters back from the edge of the Rille. AS15-82-11159. The feet of the gnomen are 50 cm apart.

Introduction

15600 is a large soil sample that was collected about 20 meters from edge of Hadley Rille (station 9a). The soil sample and the adjacent rake sample contained many olivine-normative basalt samples (156xx). Only about 2/3 of the soil sample was sieved, with about 400 grams remaining unsieved. Small rocks are described separately (see sections on 15605, 15614 etc).

15600 is part of a comprehensive suite of samples, including nearby core 15010/11, large rake sample (15612-15689) and several rocks (15545, 15595). 15531 was also collected nearby.

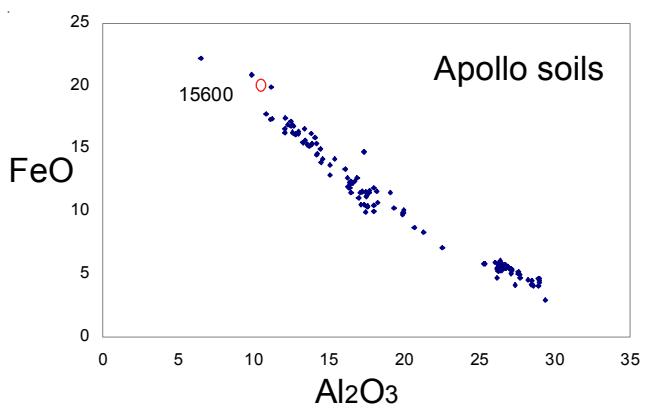


Figure 2: Chemical composition of Apollo soil samples with 15601.

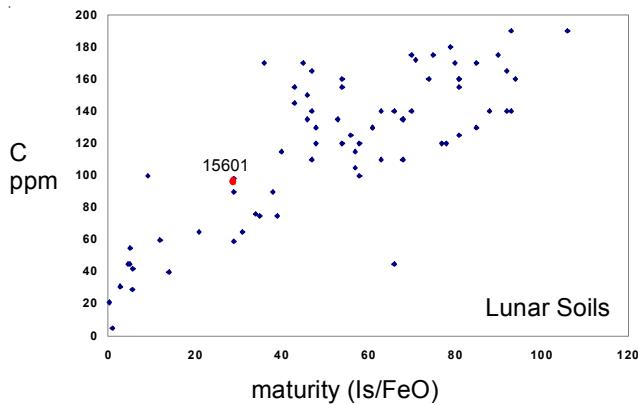


Figure 3: Carbon content and maturity index for lunar soils with 15600 (Moore et al 1973, Morris 1978).

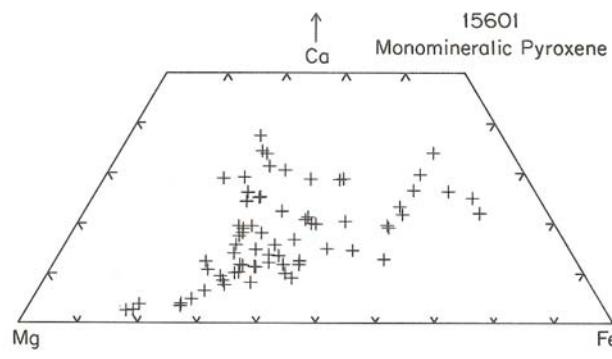


Figure 4: Composition of pyroxene in 15601 (Basu et al. 1980).

Petrography

15601 is an immature soil with $I_s/\text{FeO} = 29$ and only 32 % agglutinates (Morris 1978). The average grain size is 89 microns.

Basu et al. (1980) and Griffiths et al. (1981) determined the mineralogic mode showing high content of mare basalt, pyroxene and olivine.

Modal content of soil 15601.

From Basu et al. 1980.

Agglutinates	32 %
Basalt	15
Breccia	4.9
Anorthositic	
Norite	
Gabbro	0.3
Plagioclase	7.5
Pyroxene	27.2
Olivine	4.3
Ilmenite	0.7
Glass other	7.5

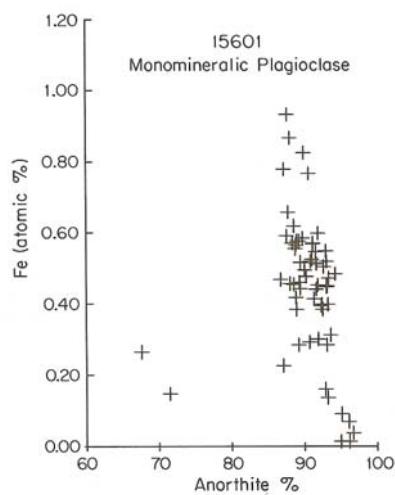
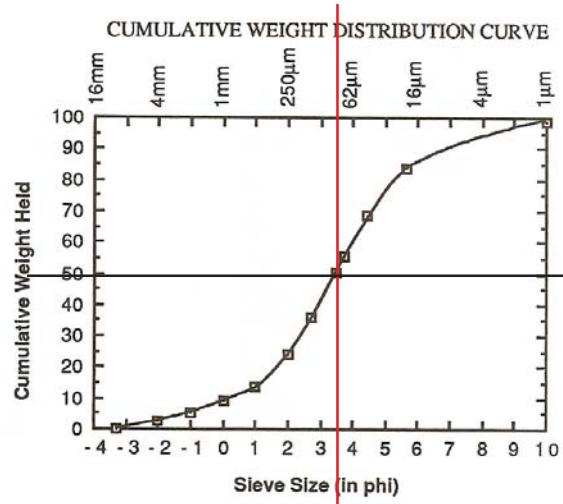


Figure 5: Fe content of plagioclase in 15601 (Basu et al. 1980).



Average grain size = 89 microns

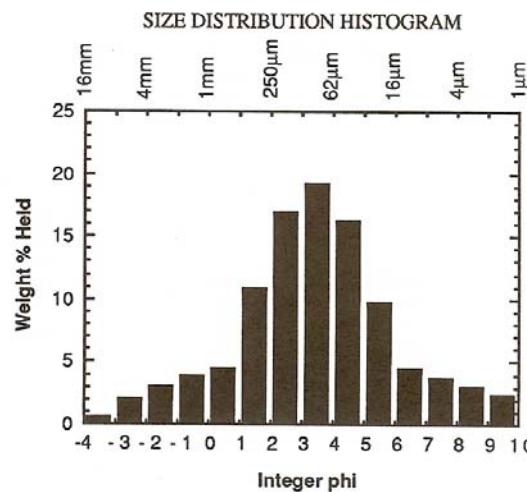


Figure 6: Grain size distribution of 15600 (from Graf 1993).

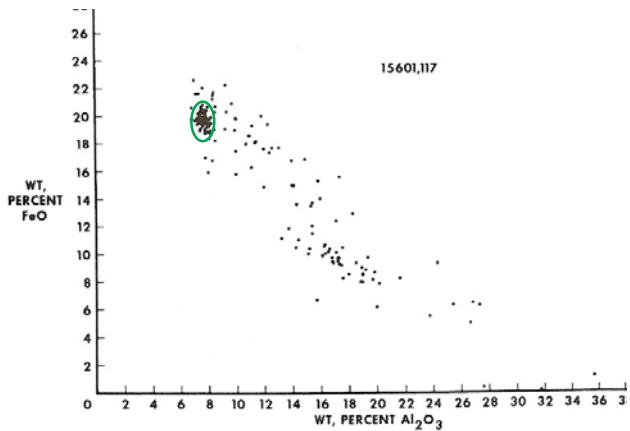


Figure 7: Composition of individual glass beads from soil sample 15601 (Reid et al. 1972).

15601 was the subject of a European Consortium to study regolith maturation and agglutinate formation (Pillinger et al. 1978, Gardiner et al. 1977, 1978).

Powell et al. (1973), Cameron et al. (1972, 1973), Helmke et al. (1973) and Ryder and Sherman (1989) studied the coarse fines from 15602 – 16504.

Walker and Papike (1981) calculated that 15601 was about 83% mare basalt, 9 % KREEP, 10 % green glass and the rest some sort of anorthositic (but they did not get a good match to known components). Schonfeld (1975) calculated 68% olivine basalt, 6 % KREEP, 17 % brown matrix breccia and 8 % green glass. However, Korotev (1987) lectures on the use of chemical mixing models.

Glass: Warner et al. (1972) and Reid et al. (1972) determined the chemical composition of numerous glass particles, finding a significant percentage with the composition of the green glass found at Spur Crater (figure 7).

Chemistry

This is the most Fe-rich soil returned, because it contained mostly mare basalt fragments (figure 2). The REE pattern is given in figure 8.

The carbon content of 15600 and 15601 is 72 or 95 ppm C (Moore et al. 1973). Kaplan et al. (1976), Petrowski et al. (1976), Gardiner et al. (1977, 1978) and Muller (1973) also determined carbon and nitrogen.

Woodcock and Pillinger (1978) determined the composition of agglutinates as a function of grain size, finding an added highland component.

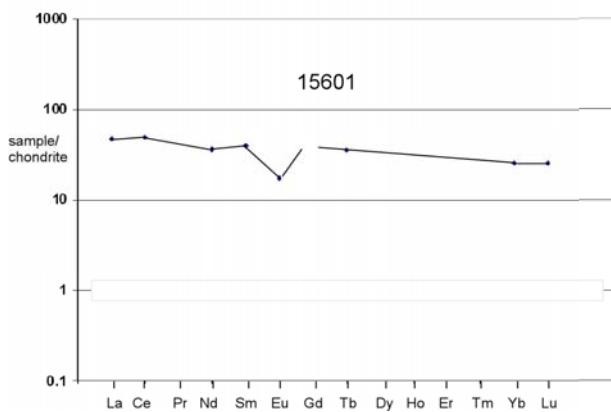


Figure 8: REE for 15601 (from Korotev 1987).

Summary of Age Data for 15603

Ar/Ar
Husain 1974 3.24 ± 0.12 b.y.
3.35 ± 0.05
3.31 ± 0.03
3.17 ± 0.07
3.26 ± 0.05
3.26 ± 0.08

Radiogenic age dating

Husain (1974) obtained the age of six basalt fragments from the coarse fines.

Cosmogenic isotopes and exposure ages

Husain (1974) determined the ^{38}Ar exposure age of 8 fragments from 15603, ranging from ~50 to 440 m.y.

Eldridge et al. (1972) and O'Kelley et al. (1972) determined the cosmic-ray-induced activity of $^{22}\text{Na} = 55$ dpm/kg, $^{26}\text{Al} = 112$ dpm/kg, $^{54}\text{Mn} = 32$ dpm/kg and $^{56}\text{Co} = 28$ dpm/kg.

Other Studies

Haggerty (1972) found a particle of enstatite chondrite in 15602.

Bogard et al. (1972), Jordan et al. (1974), Heymann et al. (1972), Schultz et al. (1978, 1979) and others have determined the concentration and isotopic ratio of the rare gasses in 15601, with special attention to the agglutinates.

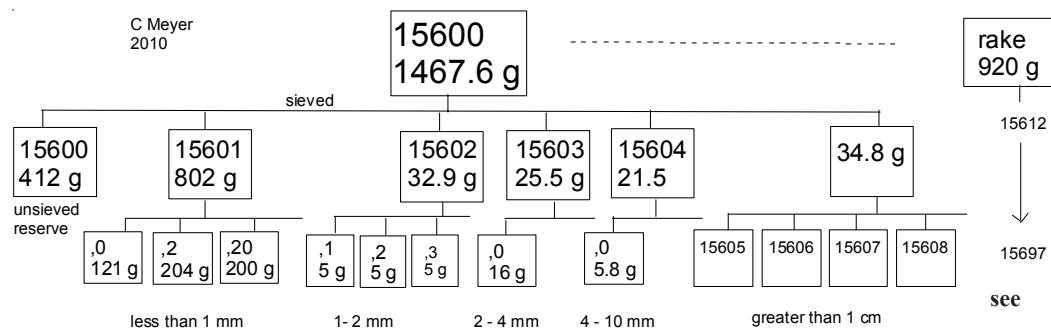
Processing

15600 was returned in a sample collection bag (#7) placed in ALSRC#2 (which did not seal).

Table 2: Walnuts and rake samples station 9a.

	weight	Ryder	ref
15605	6.1	coarse-grained olivine-normative mare basalt	
15606	10.1	coarse-grained olivine-normative mare basalt	
15607	14.8	coarse-grained olivine-normative mare basalt	
15608	1.2	porphyritic spherulitic q-normative mare basalt	
15609	1.1	fine-grained olivine-normative mare basalt	
15610	1.5	coarse-grained olivine-normative mare basalt	
15612	5.9	medium-grained olivine-normative basalt	
15613	1	medium-grained olivine-normative basalt	Dowty 73
15614	9.7	coarse-grained olivine-normative mare basalt	Dowty 73
15615	1.7	medium-grained olivine-normative basalt	Dowty 73
15616	8	medium-grained olivine-normative basalt	Dowty 73
15617	3.1	medium-grained olivine-normative basalt	Dowty 73
15618	0.8	medium-grained olivine-normative basalt	
15619	0.6	medium-grained olivine-normative basalt	
15620	6.6	medium-grained olivine-normative basalt	Dowty 73
15621	1.6	medium-grained olivine-normative basalt	
15622	29.5	medium-grained olivine-normative basalt	Chappell
15623	3	medium-grained olivine-normative basalt	Dowty 73
15624	0.2	medium-grained olivine-normative basalt	
15625	0.5	medium-grained olivine-normative basalt	
15626	0.6	medium-grained olivine-normative basalt	
15627	0.4	medium-grained olivine-normative basalt	
15628	0.4	medium-grained olivine-normative basalt	
15629	0.4	medium-grained olivine-normative basalt	
15630	23.2	medium-grained olivine-normative basalt	
15632	2.3	medium-grained olivine-normative basalt	
15633	7.4	coarse-grained olivine-normative mare basalt	Dowty 73
15634	5.2	coarse-grained olivine-normative mare basalt	
15635	0.5	medium-grained olivine-normative basalt	
15636	336.7	coarse-grained olivine-normative mare basalt	Chappell
15637	0.9	medium-grained olivine-normative basalt	
15638	3.6	medium-grained olivine-normative basalt	
15639	7	medium-grained olivine-normative basalt	
15640	0.5	medium-grained olivine-normative basalt	
15641	6.9	medium-grained olivine-normative basalt	Dowty 73
15642	1.9	medium-grained olivine-normative basalt	
15643	17.9	medium-grained olivine-normative basalt	Dowty 73
15644	0.4	medium-grained olivine-normative basalt	
15645	0.5	medium-grained olivine-normative basalt	
15647	58.2	medium-grained olivine-normative basalt	Dowty 73
15648	9.1	brecciated olivine-normative basalt	
15649	6.2	fine-grained olivine-normative mare basalt	Steele 72
15650	3.4	fine-grained olivine-normative mare basalt	
15651	1.6	fine-grained olivine-normative mare basalt	Dowty 73
15652	0.7	fine-grained olivine-normative mare basalt	
15653	0.4	fine-grained olivine-normative mare basalt	
15654	0.2	fine-grained olivine-normative mare basalt	
15655	0.4	fine-grained olivine-normative mare basalt	
15656	0.2	fine-grained olivine-normative mare basalt	
15658	11.6	medium-grained olivine-normative basalt	Chappell
15659	12.6	medium-grained olivine-normative basalt	Steele 72
15660	8.9	medium-grained olivine-normative basalt	
15661	5.9	medium-grained olivine-normative basalt	Steele 72
15662	4.9	medium-grained olivine-normative basalt	
15663	10.3	medium-grained olivine-normative basalt	Dowty 73
15664	7.4	medium-grained olivine-normative basalt	
15665	10.2	fine-grained olivine-normative mare basalt	Dowty 73
15666	3.9	porphyritic variolitic pigeonite basalt	Dowty 73
15667	1.1	porphyritic variolitic pigeonite basalt	Steele 72
15668	15.1	fine-grained olivine-normative mare basalt	

15669	4.4	fine-grained olivine-normative mare basalt	Dowty 73
15670	2	medium-grained olivine-normative basalt	
15671	6.1	medium-grained olivine-normative basalt	
15672	21.4	medium-grained olivine-normative basalt	Dowty 73
15673	5.9	medium-grained olivine-normative basalt	
15674	35.7	fine-grained olivine-normative mare basalt	Chappell
15675	34.5	fine-grained olivine-normative mare basalt	
15676	25.3	fine-grained olivine-normative mare basalt	Dowty 73
15677	6.4	fine-grained olivine-normative mare basalt	
15678	7.5	fine-grained olivine-normative mare basalt	Dowty 73
15679	0.7	fine-grained olivine-normative mare basalt	
15680	0.3	fine-grained olivine-normative mare basalt	
15681	0.3	fine-grained olivine-normative mare basalt	
15682	50.6	porphyritic variolitic pigeonite basalt	Dowty 73
15683	22	fine-grained olivine-normative mare basalt	Steele 72
15684	1.4	glass containing mare basalt	Dowty 73
15685	0.8	soil breccia	
15686	0.9	soil breccia	
15687	1.4	agglutinative glass	
15688	5.3	agglutinative glass	
15689	2.8	soil breccia	
15695	10.7	medium-grained olivine-normative basalt	
15696	12.8	medium-grained olivine-normative basalt	
15697	4.13	fine-grained olivine-normative mare basalt	
15698	3.93	glass bomb	



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